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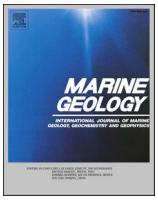

Distribution and origin of submarine landslides in the active margin of the southern Alboran Sea (Western Mediterranean Sea)

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ABSTRACT

Earthquakes are the most commonly cited cause of offshore slope failure, followed by high sedimentation rates and ensuing pore pressure build-up. In the South Alboran Sea, the moderate seismicity (Mw = 6.4) of the strike-slip Al Idrissi Fault Zone does not appear to control directly the landslides distribution. To provide a preliminary geohazard assessment, we characterized the spatial distribution, the volume and the ages of the submarine landslides from multibeam and seismic reflection data in the southern part of the Alboran Sea. Since the Quaternary numerous submarine landslide processes have affected the marine sedimentary cover with volumes of the mass transport deposits (MTD) estimated between 0.01 and 15 km^3. West of the Al Idrissi Fault Zone, along the South Alboran Ridge's northern flank, the distribution of the MTD follows the SW-NE bank and ridge trend that correlates with blind thrusts and folds covered by a plastered contourite drift. A pockmark field, related to fluid escape, is visible near landslide scars where the contourite drift is relatively thicker. In this area, landslide scars occur on variable slopes (2–24°) and their associated MTDs show variable decompacted volumes (0.01-10 km^3). East of the Al Idrissi Fault Zone, between the Alboran Ridge and the Pytheas Bank, the mapped MTDs have uneven volume. The smaller ones (<1 km^3) have their slide scars on steep slopes (>10°), whereas those of the largest ones (3–15 km^3) occur on gentler slopes (<5°).

These observations and a slope stability analysis suggest that the combination of seismic shaking, blind thrusts activity, relatively high sedimentation rate of contourite deposits with potential weak layers, and fluid escape dynamics are likely the main controlling mechanisms. These causal factors would explain the concentration of landslide head scarps at the edge of the thickest parts of the contourite drifts (i.e. crest). Slides may have been controlled locally by fluid overpressures in line with blind thrusts. Additionally, low to moderate seismicity potentially triggered by nearby faults might regionally have played a role in destabilising the landslides since 1.12 Ma (Q2 unit), which coincides with the propagation of the Al Idrissi Fault Zone in the southern Alboran Sea.

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